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Chapter

Introductory Chapter: Crystallography

Takashiro Akitsu

1. Book reviews about "greater" crystallography

Indeed, crystallography consists of wide range of not only natural sciences, mathematics, physics, chemistry, biology, and earth sciences but also applied engineering such as material and medical or pharmaceutical sciences. Like chapters in this book, I have published several book reviews of crystallographic books so far. The themes of these books are roughly classified into three categories:

1. Pure mathematical theory [1] or chemical aspects of crystal [2] or molecular [3] symmetry about group theory.

2. Techniques of crystal structure analysis such as experiments of neutron diffraction [4], computational methods about phase problem [5], and commonly used crystal structure analysis for chemical compounds [6, 7].

3. Compounds or topics solved by crystallography such as a review of structural inorganic chemistry [8] and hydrogen bonds in crystal chemistry of organic compounds [9].

Crystallographic books, of course like this book, may play a helpful with theoretical consideration or comparison with previous examples and so on.

2. Problems in crystallographic study

To data, however, my crystallographic study [10, 11] on single crystal or powder structure analysis of chemical compounds especially (chiral) metal complexes has been suffering things. I have also challenged to investigate hybrid materials composed of metal complexes and other materials such as metal nanoparticles and proteins, which are usually dealt with other types of crystallographic experiments. In other words, chemical and structural-biological (protein) single-crystal analyses are similar to each other in principle, though they are different from the actual. Combination of several techniques of crystallography should be employed or developed for these studies. Probably, spectroscopy and crystallography may be good partner to be used at the same time.

One of the serious problems may be basic level, namely, poor quality of crystal samples as a simple component for desiring hybrid materials. For both single crystal using laboratory MoKα radiation (**Figure 1** up) and powder diffraction even by

synchrotron beam (**Figure 1** down), rings due to low resolution or wide peaks sometimes appeared as shown in **Figure 1**.

I want to discuss more essential problems furthermore in order to establish integrated crystallography hybrid materials in the future.

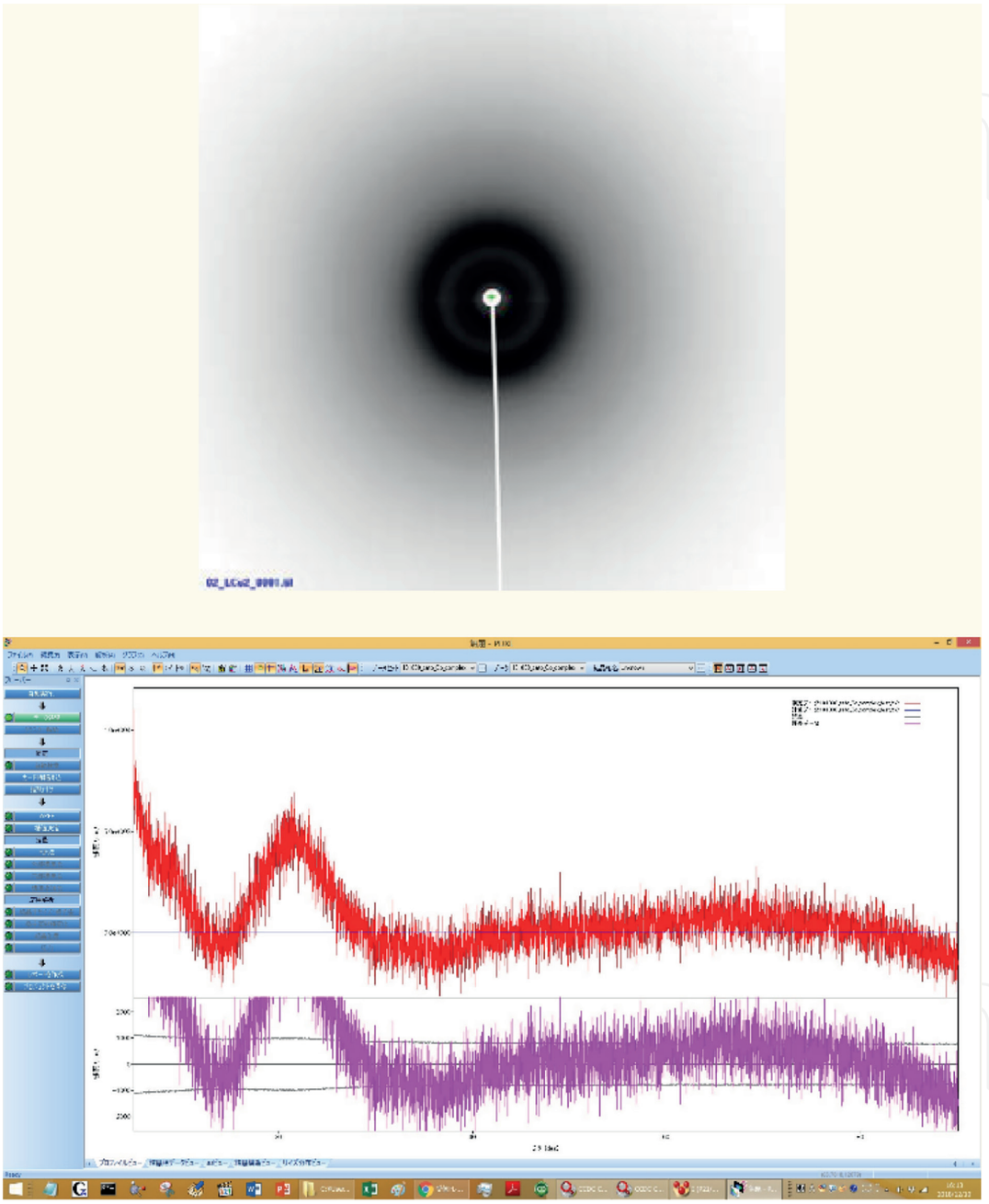

Figure 1.
Bad diffraction patterns of single crystal (up) and powder (down).

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